

## ANSWERS: Aqueous chlorine

1. Blue litmus paper will turn red and then white. When chlorine gas reacts with water, it forms an acidic solution (with  $\text{pH} < 7$ ), so the blue litmus paper turns red. The litmus paper is then bleached white as the chlorine water reacts with the substances that cause colour, to decolourise them.



Disinfectants are used to destroy micro-organisms.

The chlorine solution is acidic in nature and contains both HOCl and HCl. This denatures the enzymes in the microbes

HOCl /OCl<sup>-</sup> kill micro-organisms by attacking their cell walls (through an oxidation process) and destroying enzymes and structures inside the cell.

The chlorine based solutions are useful in hospitals because they stop (slow down) the spread of infectious disease.

### 2. Word Equation:

Chlorine gas + water → hydrochloric acid + hypochlorous acid.

### Acidic Solution:

Chlorine gas reacts with the water to form an acidic solution.

The solution is acidic due to the increase in the concentration of H<sup>+</sup> (hydrogen ions) in the solution. This increase is caused by the hydrochloric acid releasing H<sup>+</sup> ions.

### Balanced Equation:



### Disinfects Swimming Pool Water:

The hypochlorous acid, HOCl acts as the disinfectant killing any bacteria in the water. It kills the bacteria because it is an oxidant. Only very small amounts of chlorine are required to react with water for this to be effective.

3. The chlorine reacts with the water to form an acidic solution.



Chlorine kills bacteria through a fairly simple chemical reaction. The hypochlorous acid (HOCl) and hypochlorite ion (OCl<sup>-</sup>) kill microorganisms and bacteria by attacking the cell wall and destroying the enzymes and structures inside the cell, rendering them oxidised and harmless (act as a disinfectant).

HOCl and OCl<sup>-</sup> either combine with another chemical, such as ammonia, or are broken down into single atoms. Both of these processes render the chlorine harmless. Sunlight speeds these processes up. You have to keep adding chlorine to the pool as it breaks down.